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Factors associated with changes in quality of life of COPD patients: A prospective study in primary care

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Summary
Background: A primary objective in the treatment of patients with chronic obstructive pulmonary disease (COPD) is to improve their health status.
Objective: To identify the factors associated with changes in health-related quality of life (HRQoL) in patients with COPD after one year of follow-up in primary care.
Method: Multicenter, prospective study with one year of follow-up. The end-point was the change in total score on the Saint George's Respiratory Questionnaire (SGRQ). Patients with a clinically relevant (>4 points) decrease or increase in SGRQ total score were compared. Factors associated with the changes in HRQoL observed after one year were determined by logistic regression analysis.
Results: A total of 791 patients (mean age, 70.2 years) were analyzed. Mean FEV_1 (% predicted) was 52.4%. Average total SGQR score was 37.1 (SD = 19.1) at baseline and 35.6 (SD = 18.9) at follow-

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up. Significantly improved HRQoL was observed in 36.7% of patients, and was associated with starting polymedication, pulmonology visits, and balanced diet; ending respiratory rehabilitation, quitting smoking; and not being a frequent exacerbator. Quality of life worsened significantly in 29.2% of patients, and was associated with worsening respiratory symptoms and increased hospital admissions.

Conclusions: Although overall changes in HRQoL observed after one year were minimal, more than one third of patients improved significantly, and one third had significantly worse HRQoL. Clinical factors were independently associated with these changes, emphasizing the relevance to improved HRQoL of starting a healthy lifestyle and respiratory treatments and the negative impact on HRQoL of COPD symptoms onset and admissions.

Introduction

Chronic obstructive pulmonary disease (COPD) is a common health problem, with an estimated prevalence of 10.2% in the general adult population of Spain.[1] This chronic, progressive and debilitating disease is associated with deterioration in health-related quality of life (HRQoL).[2,3]

One of the primary objectives in the treatment of patients with COPD is to improve and maintain their health status by improving their symptoms, increasing functional capacity, and preventing exacerbations.[4] As a result, the study of HRQoL in patients with COPD has become a topic of growing interest.[5,6]

Although most patients with COPD are attended in the primary care setting, most studies of COPD-related changes in HRQoL have recruited hospitalized patients. These studies report progressive deterioration in HRQoL related primarily to worsening dyspnea, the presence of depression or anxiety and a cumulative effect of exacerbations,[7–10] but only a weak association between HRQoL and changes in pulmonary function.[6,10,11] Given the differences in patient characteristics and disease status, the results obtained in hospital populations may not be generalizable to patients in primary care. Two cross-sectional studies in primary care have confirmed an impact on HRQoL at all stages of the disease[3,4] and demonstrated a greater impact in patients with cough, dyspnea, and longer duration of the disease.[12] A longitudinal study in primary care patients with COPD demonstrated the negative impact of exacerbations on changes in HRQoL.[13] Nonetheless, there is a lack of studies analyzing the factors that determine HRQoL changes in patients with COPD followed prospectively in primary care.

The study objective was to describe changes in quality of life in primary care patients with COPD after one year of follow-up and identify factors that may influence the improvement or worsening of HRQoL.

Method

Study design and population

The present work was part of a multicenter, prospective study with the objective of evaluating the effectiveness of an integrated educational program directed at health professionals and designed to improve quality of life and clinical outcomes of their patients with COPD, after one year of follow-up. The study protocol[14] and the impact of the educational program were recently published.[15]

Briefly, 21 primary care centers recruited patients of both sexes who met the following inclusion criteria: at least 40 years old, with a COPD diagnosis recorded in their clinical history, and who had visited their physician during the year before study inclusion. Exclusion criteria included psychological problems, serious vision or hearing problems, asthma, tuberculosis or other chronic respiratory diseases, a terminal disease, or no telephone access.

The self-administered Saint George's Respiratory Questionnaire (SGRQ), specifically designed to evaluate the impact of chronic respiratory disease on HRQoL, was completed by all participants. Scores range from 0 (no deterioration or perfect health) to 100 (maximum effect or worst possible state of health). A difference of at least 4 points in the SGRQ total score is considered a minimum clinically important difference (MCID) from the patient's perspective.[16] Based on the difference between the baseline SGRQ total score and the score at the end of follow-up, patients were categorized into 3 groups: (a) improving HRQoL (>4 point decrease in SGQR total score), (b) worsening HRQoL (>4 point increase in SGQR total score), and (c) stable HRQoL (<4 point change in SGQR total score).

The Committee on Clinical Research and Ethics of the Jordi Gol Institute for Primary Care Research (Barcelona, Spain) approved the study. All patients provided written informed consent to participate.

Data collection and sources

Data were collected from a review of clinical records and from individual patient interviews.

A) Information gathered from clinical records:

Sociodemographic data, comorbidities, smoking habits, follow-up spirometry (recorded in the clinical record during routine monitoring of COPD in clinical practice over the year preceding study inclusion), FEV_1(%), number of exacerbations, health care resources utilized, preventive activities and treatment received during the year before study inclusion.

B) Information gathered from patient interviews:

Smoking habits, lifestyle habits, chronic respiratory symptoms, hospital admissions during the year before study

inclusion, dyspnea as measured by the Medical Research Council (MRC) scale,[17] and SGRQ score, using the validated Spanish-language translation of the questionnaire.[18] All variables were collected at baseline and after 12 months.

Statistical analysis

Descriptive statistics were used to summarize overall information. Categorical variables were expressed as number (percentage), and continuous as mean (standard deviation) or median (interquartile range). To identify the factors significantly associated with changes in HRQoL, patient characteristics were compared for those with a clinically relevant change in SGRQ total score after one year of follow-up. The differences within groups at baseline and follow-up were assessed using independent or paired *t*-test, Wilcoxon signed rank tests, chi squared test, and Fisher exact or McNemar test for unadjusted comparisons, as appropriate. At one-year follow-up, we assessed differences between the study groups in the changes observed.

To identify which clinical changes were independently associated with improvement or worsening of patient health during follow-up, logistic regression models were constructed that had as their end point improvement vs all other participants and worsening vs all other participants. In the case of improved health, standard error (SE) was adjusted by the cluster effect (EAP); because of variability between primary care centers in patients with worsened health, multilevel logistic models were constructed. The variables considered were smoking habit, depression, exercise, diet, cough, expectoration, frequency of exacerbacions, doctor's visits, nurse visits, pulmonologist visits, respiratory rehabilitation, hospital admissions, polymedication, and adherence to treatment and to advice provided about smoking, diet, and exercise. These variables were classified into 4 categories according to the change from baseline at one year of follow-up: never (not present at baseline or follow-up), incident (not present at baseline but appeared during follow-up), remission (present at baseline but disappeared during follow-up), and persistent (present at baseline and during follow-up). In addition, we considered the degree of dyspnea as continuous variable and the assignment of the patient to the educational program as dichotomous variable. All statistical tests were two-sided at the 5% significance level. Analyses were performed using Stata/SE version 11.1 for Windows (Stata Corp. LP, College Station, Texas, US).

Results

Characteristics of the population

Of the 801 patients who were eligible, 791 (98.7%) completed the SGQR at baseline and at one year of follow-up and were included in the analysis. In the study population, the mean age was 70.2 years (standard deviation [SD]: 9.1), most were men (87.4%), mean duration of COPD was 7.7 years (SD: 5.8), and mean FEV_1(%) was 52.3% (SD: 18.6%) (Table 1).

Changes in health-related quality of life

The mean total SGQR score was 37.1 (SD: 19.1) at baseline and 35.6 (SD: 18.9) at one year of follow-up, which indicates a mean of −1.5 point change in HRQoL. Although this change was significant ($p = 0.016$), it did not achieve the clinical relevance defined as a change of more than 4 points in total SGQR score. At the end of follow-up, 290 patients (36.7%) had an improving quality of life and 231 patients (29.2%) had a worsening quality of life. The remaining 270 patients (34.1%) had no clinically relevant score change.

Baseline characteristics were comparable for patients in both groups, except for respiratory rehabilitation, which was more frequent in patients whose HRQoL improved (Table 1).

Factors associated with HRQoL changes in patients with COPD after one year of follow-up

Among patients who had an improving HRQoL at one year of follow-up, there was a significant increase in the percentage of patients taking multiple medications (14.8% increase, $p < 0.001$) and in those who visited a pulmonologist (11.1% increase). In addition to the importance of starting these medical treatments, there were increases in influenza vaccinations (7.6% increase, $p < 0.01$) and ex-smokers (3.8% increase, $p < 0.01$), and a 4.2% decline in current smokers, although the latter result was not significantly different from the group with worsening HRQoL. A non-significant increase in regular exercise in this group differed significantly however (3.7%; $p < 0.001$) from the group with worsening HRQoL (Table 2).

Patients with deterioration in HRQoL after one year of follow-up had notably worsened symptoms, including a significant increase in percentage of patients with coughing (13.4%), expectoration (12.5%), and a significant increase in hospital admissions (9.5%) and rehabilitation visits (3.9%) compared to patients whose HRQoL was improving (Table 2; Fig. 1). All comparisons were significant at the level of $p < 0.001$. In addition, there was a direct relationship between changes in dyspnea measured by the MRC and significant changes in HRQoL during the year of observation (Fig. 2).

Regarding the use of healthcare resources, both groups (improving or worsening HRQoL) had fewer doctor's visits, a more balanced diet, and more exacerbations at one year of follow-up (Table 2).

Identification of factors independently associated with improving or worsening HRQoL

Factors significantly associated with improving HRQoL are shown in Table 3. Initiation of pulmonology visits, polymedication, and a balanced diet; along with ending rehabilitation and quitting smoking; having a lower degree of dyspnea and not being a frequent exacerbator were independently and significantly associated with a higher probability of improvement in HRQoL after one year of follow-up.

Table 1 Baseline characteristics of the patients included in the study according to the change in SGRQ total score at one year of follow-up.

Variable	Total $N = 791$	Improved HRQoL decrease ≥4 SGRQ $n = 290$	Worsened HRQoL increase ≥4 SGRQ $n = 231$
Sociodemographic characteristics			
Age (years), mean (SD)	70.2 (9.1)	69.8 (8.09)	70.9 (9.3)
Sex: male	691 (87.4)	254 (87.6)	209 (90.5)
Education level			
None	298 (37.7)	100 (34.5)	88 (38.1)
Primary	437 (55.2)	166 (57.2)	130 (56.3)
Other	56 (7.1)	24 (8.3)	13 (5.6)
Tobacco consumption			
Non-smoker	115 (14.5)	46 (15.9)	24 (10.4)
Ex-smoker	521 (65.9)	189 (65.2)	166 (71.9)
Smoker	155 (19.6)	55 (19)	41 (17.7)
Comorbidities			
Metabolic disease	579 (73.2)	210 (72.4)	172 (74.5)
Anxiety	81 (10.2)	28 (9.07)	29 (12.6)
Depression	95 (12)	27 (9.3)	32 (13.9)
Study group			
Intervention	395 (49.9)	131 (45.2)	98 (42.4)
Control	396 (50.1)	159 (54.8)	133 (57.6)
Lifestyle			
Balanced diet	586 (74.7)	217 (74.8)	173 (74.9)
Regular exercise	606 (77.1)	229 (79)	177 (76.6)
Years of COPD evolution, mean (SD)	7.7 (5.8)	7.47 (4.9)	8,1 (6.4)
FEV_1 (% predicted); mean (SD)	52.3 (18.6)	53.8 (17.6)	48.8 (20.4)
Chronic symptoms			
Dyspnea (MRC); mean(SD)	2.4 (1.1)	2.4 (1.1)	2.4 (1.1)
Cough	384 (48.5)	146 (50.3)	103 (44.6)
Sputum	442 (55.9)	165 (56.9)	121 (52.4)
Clinical progress			
Patients with exacerbations	463 (58.5)	176 (60.7)	132 (57.1)
Exacerbations; median (interquartile range)	1 (0—2)	1 (0—1.25)	1 (0—1)
Frequent exacerbator (2 or more)	203 (25.7)	72 (24.8)	55 (23.8)
Patients admitted	92 (11.6)	31 (10.7)	26 (11.3)
Admissions; median (interquartile range)	1 (1—2)	1 (1—2)	1 (1—1)
Appointment			
Primary care physician	748 (94.6)	276 (95.2)	216 (93.5)
Primary care nurse	275 (34.8)	99 (34.1)	66 (28.6)
Pulmonologist	236 (29.8)	81 (27.9)	79 (34.2)
Advice given to patients			
Smoking cessation	179 (22.6)	59 (20.3)	48 (20.8)
Diet	151 (19.1)	58 (20)	43 (18)
Physical exercise	124 (15.7)	52 (17.9)	32 (13.9)
Influenza vaccinations	629 (79.5)	227 (78.3)	193 (83.5)
Chronic treatment			
Multiple medications	689 (87.1)	255 (87.9)	205 (88.7)
Rehabilitation	28 (3.5)	16 (5.5)	2 (0.9)*

SGRQ, Saint George Respiratory Questionnaire; COPD, chronic obstructive pulmonary disease; SD, standard deviation; FEV_1, forced expired volume in one second; MRC, Medical Research Council. The data are *n* (%), unless otherwise indicated. *$p < 0.01$.

Factors significantly associated with worsening HRQoL are shown in Table 4. An increase in symptoms (incidence of expectoration and increased dyspnea) and hospital admissions were independently and significantly associated with a higher probability of worsening HRQoL after one year of follow-up.

Discussion

Our results indicate that patients with COPD attended by primary care physicians have no relevant deterioration in their HRQoL over one year, when considered globally; however, there was a great variability at the individual

Table 2 Change within and between groups according to improvement or worsening of SGRQ scores. Values are %.

Variable	Improving quality of life. SGRQ ≥ -4 points		Worsening quality of life. SGRQ $\geq +4$ points		Differences between groups	
	Change % (follow-up − baseline) $n = 290$	(95% CI)	Change % (follow-up − baseline) $n = 231$	95% CI	(Degree of improvement − degree of worsening)[a]	(95% CI)
Tobacco use						
Non-smoker	0.3	(−0.67; 0.67)	0	(−0.83; 0.83)	0.30	(−0.32; 0.92)
Ex-smoker	3.8**	(0.58; 5.75)	1.70	(−1.04; 3.24)	2.10	(−0.66; 4.86)
Smoker	−4.2**	(−5.76; −1.06)	−1.70	(−3.24; 1.04)	−2.50	(−5.34; 0.34)
Depression/anxiety	−1	(−6.48; 4.41)	−2.60	(−8.93; 3.74)	1.60	(−0.75; 3.95)
Lifestyle						
Balanced diet	13.1***	(7.48; 18.71)	12.10***	(4.99; 16.93)	1	(−4.72; 6.72)
Regular exercise	0.7	(−4.36; 5.74)	−3	(−8.35; 2.26)	3.70***	(1.29; 6.10)
Symptoms						
Dyspnea degree, mean	−0.15*	(0.01; 0.28)	0.29***	(0.15; 0.43)	−0.44***	(−0.63; −0.24)
Cough	−2	(−8.61; 4.47)	13.40***	(6.48; 20.35)	−15.40***	(−20.07; −10.72)
Sputum	−3.5	(−9.55; 2.65)	12.50***	(5.69; 19.41)	−16***	(−20.76; −11.23)
Clinical progress						
Patients with exacerbations	13.4***	(9.07; 17.04)	15.20***	(9.95; 19.36)	−1.80	(−7.86; 4.26)
Exacerbations (2 or more)	6.9**	(2.08; 11.70)	8.70**	(3.14; 14.17)	−0.02	(−6.46; 2.86)
No exacerbations, mean	0.47***	(0.24; 0.68)	0.46***	(0.25; 0.66)	0.01	(−0.29; 0.31)
Patients admitted	4.1**	(1.55; 4.81)	9.50***	(5.37; 13.67)	−5.40*	(−9.81; −0,98)
No admissions, mean	0.23	(0.10; 0.57)	1.07***	(0.43; 1.68)	−0.84*	(−1.56; −0.12)
Appointment						
Primary care physician	−16.60***	(−21.70; −11.40)	−21.60***	(−27.71; −15.57)	5	(−1.81; 11.81)
Primary care nurse	2.50	(−4.02; 8.85)	0.80	(−6.13; 7.86)	1.70	(−0.43; 3.83)
Pulmonologist	11.10***	(6.98; 14.32)	2.60	(−0.47; 2.99)	8.50***	(4.34; 12.65)
Vaccinations						
Influenza	7.60**	(2.79; 12.38)	0.90	(−3.62; 5.35)	6.70***	(3.41; 9.98)
COPD treatment						
Multiple medications	14.80***	(9.77; 19.38)	6.10	(1.63; 10.48)**	8.7***	(0.04; 0.14)
Rehabilitation	−1.40	(−4.39; 1.63)	3.90*	(0.83; 4.74)	−5.30***	(−8.13; −2.46)

COPD: chronic obstructive pulmonary disease; SGRQ: Saint George Respiratory Questionnaire.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.
[a] Change was 1-year follow-up minus baseline. Difference in SGRQ change: positive values correspond to the group with improving HRQoL, negative values to worsening HRQoL.

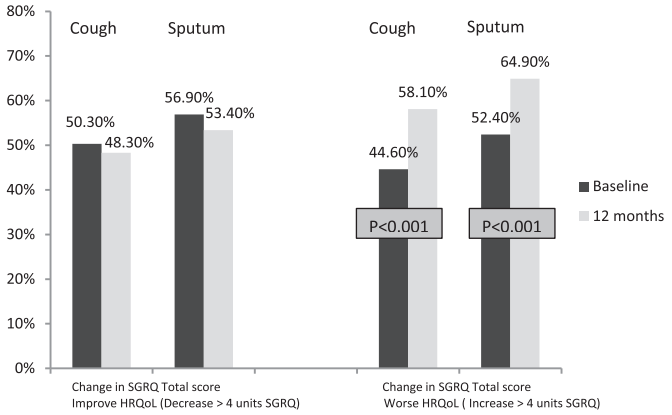

Figure 1 Relationship between change in SGRQ total score and change in respiratory symptoms at one year of follow-up.

level. One third (36.7%) of patients had clinically relevant improvement in HRQoL, associated with starting polymedication, pulmonologist visits, and adherence to a balanced diet; ending respiratory rehabilitation, quitting smoking; and not being a frequent exacerbator. On the other hand, nearly one third (29.2%) had worsening HRQoL, associated with an increase in symptoms and in hospital admissions.

Most studies of HRQoL deterioration over time in patients with COPD have been conducted in hospital populations.[8,19,20] In the primary care context, most studies are cross-sectional and report a major HRQoL impact among patients with COPD.[3,12] Very few have assessed HRQoL longitudinally; furthermore, they tend to focus on acute exacerbations.[13]

In agreement with other studies in primary care,[13] our patients globally did not report a major deterioration in HRQoL at one year of follow-up. Our results contrast with those obtained in hospitalized patients, who had clinically evident deterioration in HRQoL during follow-up.[8,19] These differences could be due to the hospital population's general characteristics, including more serious health problems, more comorbidities, and worse baseline HRQoL, which could lead to more rapid decline in HRQoL. In addition, these studies are usually conducted over a longer time period, which makes it easier to observe changes.

An important and innovative contribution of this study is the identification of changes in clinical and treatment factors that are associated with significant changes in HRQoL.

It is known that rehabilitation improves dyspnea, exercise capacity, and quality of life of patients with COPD.[21] Interestingly, we observed a reduction in rehabilitation visits associated with an improvement in HRQoL. We postulate that patients left rehabilitation after experiencing an improvement in HRQoL, while worsening HRQoL could have increased the indications for rehabilitation, in accordance with current recommendations.[21,22]

In our results, smoking cessation has been associated with HRQoL improvement. Tobacco use is considered an important factor in the health status of patients with COPD,[23] leading to worse health in smokers vs ex-smokers and non-smokers.[19,24] Smoking cessation may have contributed to symptoms improvement in our study participants, particularly coughing and expectoration, thereby at least partially explaining HRQoL improvement. Similarly,

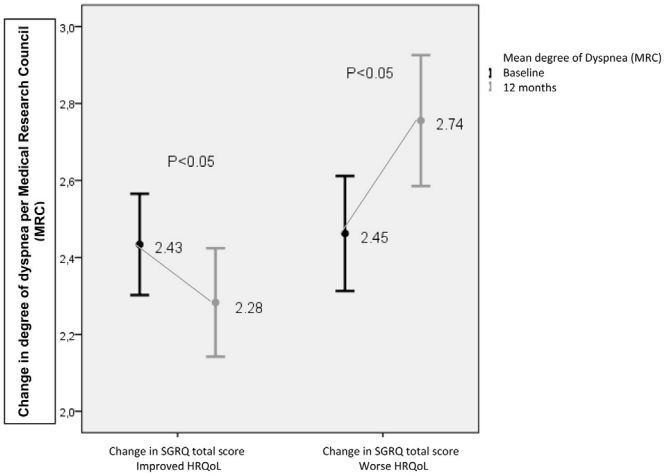

Figure 2 Relationship between change in SGRQ total score and change in degree of dyspnea per Medical Research Council (MRC) definition at one year of follow-up.

Table 3 Independent factors associated with an improvement of SGRQ scores (>4 units) over one year of follow-up. Logistic regression model.

Variable	Estimated adjusted OR	95% confidence interval		*P*-value in the model
Tobacco use (ref. persistent smoker) Remission smoker	4.66	1.67	12.97	0.003
Diet (ref. never) Incidence of healthy diet	2.99	1.17	7.59	0.021
Dyspnea degree	0.66	0.54	0.81	<0.001
Frequent exacerbator (ref. incidence) Never	2.06	1.31	3.22	0.002
Visits to pulmonologist (ref. never) Incidence of visits	2.998	1.42	5.85	0.003
Rehabilitation (ref. never) Remission	4.73	1.45	15.40	0.010
Polymedication (ref. never) Incidence of polymedication	3.32	2.01	5.48	<0.001

All ORs are adjusted for each variable presented in the Table.
Dyspnea degree as continuous.

Hejidra et al.[24] observed fewer respiratory symptoms in ex-smokers and better HRQoL compared to current smokers.

We observed that more intense medical attention was associated with improving HRQoL. Starting pulmonology visits and polymedication, along with starting a balanced diet, influenced improvements in patient health. This contrasts with previous studies that associate the use of multiple medications in treating COPD with a reduced HRQoL for these patients.[25,26] Nonetheless, there may be an indication bias in these cross-sectional studies; it was not possible to establish the order of causality.

On the other hand, patients with worse HRQoL had a significant increase in respiratory symptoms and more frequent hospital admissions.

Although the value of these factors as predictors of worse HRQoL is well established,[3,6,12,27,28] the present study evaluated not only the presence of these characteristics but also their incidence during the year of follow-up. This study design allowed the observation that the incidence of certain symptoms influenced HRQoL more than their persistence. This may be the result of an adaptation phenomenon: the patient adapts to persistent symptoms, and so additional new symptoms would have a comparatively greater impact on quality of life.

Studies of the relationship between HRQoL and COPD symptoms have identified dyspnea and, to a lesser extent, chronic cough, expectoration, and wheezing as the factors associated with a worse HRQoL.[3,8,12,27] We have extended these findings with the observation that onset of expectoration and increased dyspnea were associated with a significant worsening of HRQoL.

Some studies suggest that symptoms may constitute a marker of inflammation and could help to identify an inflammatory phenotype in COPD.[29,30] Our results point toward possible links between increased symptoms, more frequent exacerbations and hospitalizations, and worsening in quality of life, perhaps mediated by or associated with increased inflammation.

Independently of changes in HRQoL, we observed a decline in visits to a family doctor during follow-up. Some studies have described the limited use of health care by individuals with chronic respiratory symptoms[31]; others

Table 4 Independent factors associated with worsening SGRQ scores (>4 units) at one year of follow-up. Multilevel logistic regression model.

Variables	Estimated adjusted OR	95% confidence interval		*P*-value in the model
Group (ref. control)	0.61	0.39	0.95	0.032
Dyspnea degree	1.32	1.12	1.56	0.001
Expectoration (ref. never) Incidence of expectoration	2.80	1.65	4.74	<0.001
Visits to pulmonologist (ref. never) Incidence of visits	0.26	0.11	0.63	0.003
Hospital admissions (ref. never) Incidence of admissions	3.34	1.69	6.61	0.001

All ORs are adjusted for each variable presented in the Table.
Variance = 0.32; SE = 0.12.
Dyspnea degree as continuous.

highlight primary care professionals' lack of familiarity with treating this disease.[32] However, the study design required that all participating patients have at least one clinic visit during the year preceding their inclusion. Approximately 30% of included patients did not suffer any exacerbation during follow-up, so it's likely they did not visit to their FP because they perceived their disease as stable. If this were the case, part of the observed reduction in medical visits may have been an effect of the study design.

Exacerbations of COPD are a decisive factor in worsening HRQoL.[13,28,33] We observed a worsening HRQoL in patients who experienced more exacerbations; however, patients with improving HRQoL also had an increase in exacerbations. Nonetheless, a significant association existed between not being a frequent exacerbator and improvement in HRQoL. This suggests that HRQoL improvement requires not only fewer acute episodes but also their total prevention.

Our study has several limitations. We could not assess the accuracy of the COPD diagnosis; however, the characteristics of the included population very closely resembled those of other series of patients with spirometrically confirmed COPD. We evaluated only FEV_1 because this value is more frequently recorded in medical records and classifies the severity of airflow obstruction and staging, according to Global Initiative for Chronic Obstructive Lung Disease stages. In the study population, the mean age was 70.2 years, most were men (87.4%) and mean duration of COPD was 7.7 years. Although these characteristics are representative of the primary care population of patients with COPD in Spain,[1,12,27] the extrapolation of the results to other populations must be made with caution.

Another limitation of this study is the length of follow-up. Longer follow-up can be expected to provide more information concerning the changes that patients experience and their possible impact on quality of life. Nonetheless, we were able to observe clinically important changes in HRQoL in nearly two thirds of the study population (36.7% improving and 29.2% worsening quality of life). Another important limitation is that the study involved patients who participated in a previously reported study to evaluate the effectiveness of an educational intervention directed at health professionals, with the goal of improving quality of life and clinical outcomes of their patients with COPD. Although in theory this could have affected the study results, the regression analysis was adjusted for participation in the educational intervention.

Strengths of the study include its longitudinal design and its primary care setting, with a very broad sample of patients with different degrees of pulmonary involvement and standardized, systematic data collection by the research team.

Conclusions

Although overall changes in HRQoL observed during one year of follow-up were minimal, there was great variability at the individual level. More than a third of patients had an improvement in HRQoL at one year of follow-up, associated with starting polymedication, pulmonology visits, and a balanced diet; ending respiratory rehabilitation, quitting smoking habit, and not being a frequent exacerbator. Nearly one third had a worsening HRQoL after one year, associated with an increase in symptoms and hospital admissions. Notably, the onset of new symptoms negatively influenced HRQoL more than their persistence.

Conflict of interest

I declare on behalf of my co-authors and myself that we do not have any conflict of interest to declare.

The current manuscript presents original data. No part of this manuscript is currently under consideration nor has been accepted for publication elsewhere.

All authors have read and approved the final version of the submitted manuscript.

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